

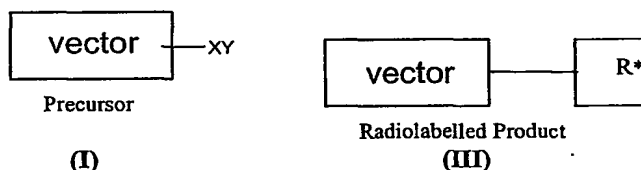
Claims

1. A process for purifying a radiolabelled product which comprises use of a solid-
 5 support bound scavenger group of formula (IV):



wherein Z is a scavenger group and SP is a solid support.

- 10 2. A process comprising the steps of:
 (a) contacting a solution-phase mixture of a radiolabelled product of formula (III)
 and excess precursor of formula (I):



- 15 wherein XY is a functional group and R* is a radioisotope or radiolabelled portion;
 with a compound of formula (IV):



- 20 wherein Z is a scavenger group;

such that the compounds of formulae (IV) and (I) may form a covalent bond to
 each other;

- 25 (b) separation of purified radiolabelled product of formula (III) in the solution
 phase.

3. A process according to claim 1 or 2 wherein the scavenger group Z is an

isocyanate, isothiocyanate, thiol, hydrazine, hydrazide, aminooxy, 1,3-dipole, aldehyde or ketone.

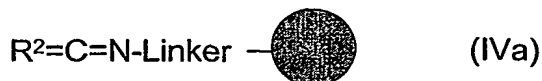
4. A process according to any of claims 1 to 3 comprising the steps of:

- 5 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIa) and excess precursor of formula (Ia):



10 wherein R¹ is C₁₋₆ alkyl and R* is [¹¹C]-C₁₋₆alkyl, such as -¹¹CH₃ or [¹⁸F]fluoro C₁₋₆ alkyl or [¹⁸F]fluoro C₆₋₁₂ aryl;

with a compound of formula (IVa):



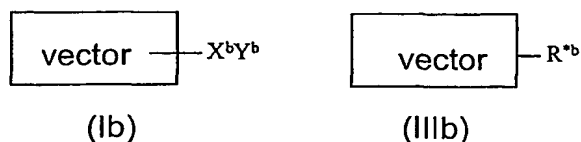
15 wherein R² is oxygen or sulphur
such that the compounds of formulae (IVa) and (Ia) may form a covalent bond to each other; and

20 (b) separation of purified radiolabelled product of formula (IIIa) in the solution phase.

5. A process according to any of claims 1 to 3 comprising the steps of:

(a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIb) and excess precursor of formula (Ib):

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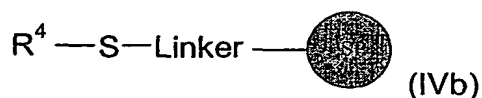


wherein either

(i) the functional group $-X^bY^b$ in the compound of formula (Ib) is $-\text{OSO}_2\text{R}^3$ wherein R^3 is C_{1-15} alkyl or C_{1-10} alkylaryl and R^3 is optionally substituted by halo (preferably fluoro), for example R^3 is methyl, para-toluene, trifluoromethyl, and R^b in the compound of formula (IIIb) is a radiohalogen such as radiofluoro (for example ^{18}F) or radioiodo (such as ^{123}I , ^{124}I , or ^{125}I) or radiobromo (such as ^{76}Br); or

(ii) the functional group $-X^bY^b$ in the compound of formula (Ib) is $-\text{C}(\text{O})\text{CH}_2\text{Cl}$ and R^b in the compound of formula (IIIb) is $-\text{S}-\text{L}^b-^n\text{F}$ wherein L^b is a C_{1-30} hydrocarbyl linker group optionally including 1 to 10 heteroatoms; and ^nF is a radioisotope of fluorine such as ^{18}F ;

with a compound of formula (IVb):



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wherein R^4 is hydrogen;

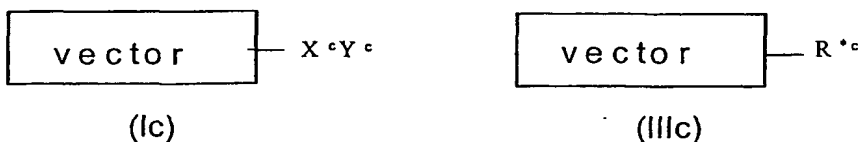
such that the compounds of formulae (IVb) and (Ib) may form a covalent bond to each other;

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(b) separation of purified radiolabelled product of formula (IIIb) in the solution phase.

25 6. A process according to any of claims 1 to 3 comprising the steps of:

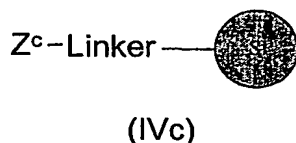
(a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIc) and excess precursor of formula (Ic):



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wherein the functional group $-X^cY^c$ in the compound of formula (Ic) is an aldehyde or ketone and R^{*c} in the compound of formula (IIIc) is $=N-W-Linker-F$ where W is C_{1-15} alkyl or C_{7-15} aryl, with a compound of formula (IVc):

5



wherein Z^c is selected from $-NH_2$, hydrazine, hydrazide, aminoxy, phenylhydrazines, semicarbazide, or thiosemicarbazide; such that the compounds of formulae (IVc) and (Ic) may form a covalent bond to each other; and

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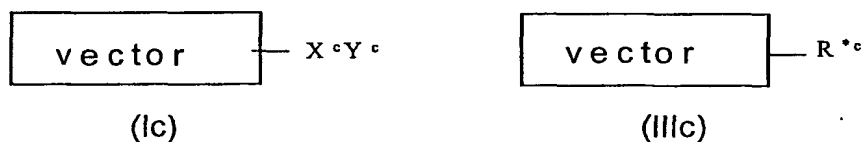
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(b) separation of purified radiolabelled product of formula (IIIc) in the solution phase.

7. A process according to any of claims 1 to 3 comprising the steps of:

(a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIc) and excess precursor of formula (Ic):

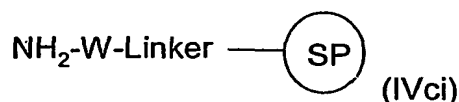
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wherein the functional group $-X^cY^c$ in the compound of formula (Ic) is $-OSO_2R^3$ wherein R^3 is C_{1-15} alkyl or C_{1-10} alkylaryl and R^3 is optionally substituted by halo (preferably fluoro), for example R^3 is methyl, para-toluene, trifluoromethyl and R^{*c} in the compound of formula (IIIc) is $=N-W-Linker-F$ where W is C_{1-15} alkyl or C_{7-15} aryl, with a compound of formula (IVci):

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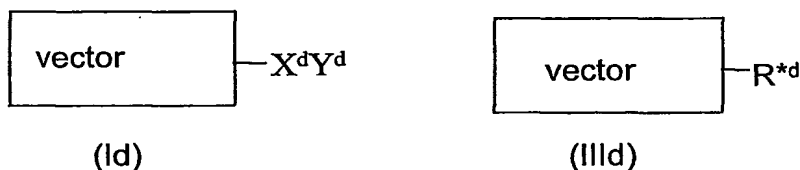
where W is selected from C₁₋₁₅ alkyl or C₇₋₁₅ aryl, -NH-, -NH-CO- or -O- ;
such that the compounds of formulae (IVci) and (Ic) may form a covalent bond to
each other; and

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(b) separation of purified radiolabelled product of formula (IIIc) in the solution
phase.

8. A process according to any of claims 1 to 3 comprising the steps of:

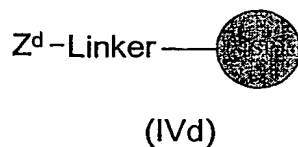
- 10 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIId)
and excess precursor of formula (Id):



- 15 wherein the functional group —X^dY^d in the compound of formula (Id) is an amine,
hydrazine, hydrazide, aminooxy, phenylhydrazine, or semicarbazide,
thiosemicarbazide group and R^{*d} in the compound of formula (IIId) is
=CH-Linker-F where the linker comprises an alkyl, aryl or polyethylene glycol
component;

20

with a compound of formula (IVd):



25

wherein Z^d is an aldehyde or ketone moiety;
such that the compounds of formulae (IVd) and (Id) may form a covalent bond to
each other; and

(b) separation of purified radiolabelled product of formula (IIId) in the solution phase.

9. A process according to claim 8 wherein the compound of formula (IVd) has a ketone scavenging group based on a ring-opening metathesis polymerisation (ROMP) polymer backbone.

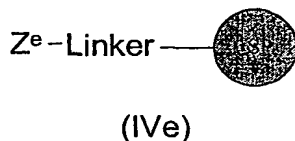
10. A process according to any of claims 1 to 3 comprising the steps of

10 (a) contacting a solution-phase mixture of a radiolabelled product of formula (IIIe) and a by-product (VIIe):



15 wherein the by-product (VIIe) contains an unwanted double bond, formed by an elimination side-reaction, and R^{*e} in the compound of formula (IIIe) is radiohalo, particularly [¹⁸F]fluoro;

with a compound of formula (IVe):

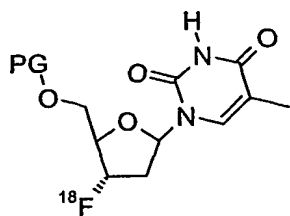


20 wherein Z^e is a 1,3-dipole such as —N=N⁺=N⁻ or —C≡N⁺-O⁻ such that the compounds of formula (IVe) and (VIIe) may form a covalent bond to each other; and

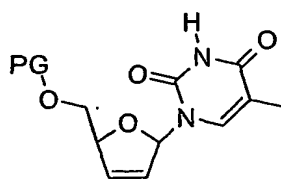
(b) separation of purified radiolabelled product of formula (IIIe) in the solution phase.

30 11. A process according to claim 10 wherein the compound of formula (IIIe) and

(VIle) are:



(IIIle)

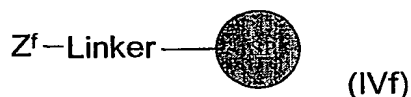


(VIle)

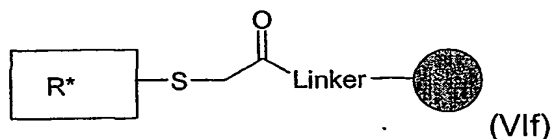
wherein each PG is hydrogen or a hydroxyl protecting group (suitably tert-butoxycarbonyl, benzyl, triphenylmethyl, or dimethoxytriphenylmethyl).

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12. A process according to claim 1 which comprises use of a compound of formula (IVf):



10 wherein Z^f is $\text{Cl-CH}_2\text{-CO-}$ or another haloacetyl containing moiety for removal of unreacted radiolabelling agent containing a thiol moiety from a reaction mixture resulting in formation of a compound of formula (VI f):



15

wherein R^* is a radioisotope or radiolabelled portion.

13. An automated radiosynthesis apparatus, or a cassette therefor, comprising a vessel, such as a cartridge, containing a solid-support bound scavenger group of
20 formula (IV), (IVa), (IVb), (IVc), (IVd), (IVe), or (IVf) as defined in claims 1 to 12.